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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/721,167	11/22/2000	Yoram Uziel	STC-38090	3296

32588 7590 03/04/2003

APPLIED MATERIALS, INC.  
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SANTA CLARA, CA 95050

EXAMINER

HASSANZADEH, PARVIZ

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 03/04/2003

15

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/721,167

Applicant(s)

UZIEL ET AL.

Examiner

Parviz Hassanzadeh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 11 February 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,3 and 5-51 is/are pending in the application.
- 4a) Of the above claim(s) 19,20 and 34-51 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,5-18 and 21-33 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 February 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☒ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election without traverse of Species 1 of group I, claims 1-18 and 21-33, in Paper No. 9 is acknowledged.

Claims 19, 20 and 34-51 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species 2 and method, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 9.

### ***Priority***

Acknowledgment is made of applicant's claim for foreign priority based on an application filed in PCT on 12/23/99. It is noted, however, that applicant has not filed a certified copy of the PCT application as required by 35 U.S.C. 119(b).

### ***Drawings***

The corrected or substitute drawings were received on 2/11/03. These drawings are acceptable by the Examiner.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**Claims 1, 3, 5-11, 21, 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maekawa et al (EP-0,764,478-A1) in view of Engelsberg et al (US Patent No. 5,531,857) and Vaught (US Patent No. 5,023,424).**

Maekawa et al teach an apparatus for cleaning (*removing particles from*) the surface of a substrate, the apparatus comprising:

a spin chuck 2 for holding a semiconductor substrate 1 (*moving chuck, which is configured to receive the substrate and to move the substrate*); and

a *vertically and horizontally movable swing arm 7* which supports a cleaning unit 6 (column 4, line 15-37).

Maekawa et al fail to teach an optical arm adapted to direct a beam of electromagnetic energy onto the surface of the substrate causing the particles to be dislodged from the surface.

Engelsberg et al teach an apparatus for removing surface contaminants from the surface of a substrate by high energy radiation without damaging the substrate. The apparatus includes a means for flowing a gas 18 over a substrate 12 and a radiation source 14 such as a laser for

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generating a radiation 11 directed against the treatment surface of the substrate (column 4, line 29 through column 5, line 15). The radiation from a radiation source 14 can be conducted through a radiation conduit 50 which is an optical guide such as a bundle of optical fibers or light pipe while a gas is conducted from a gas source 16 to the treatment surface via gas line 51. radiation conduit 50 and gas line 51 merge to a cable head 53 (Fig. 5, column 9, lines 61 through column 10, line ). The cable 53 through a robotic arm 81 can spin 360 degree and a base 83 thereof can be moved up and down (Fig. 9, column 12, lines 12-23).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the optical arm as taught by Engelsberg et al in the apparatus of Maekawa et al in order to remove particles from the surface of a substrate without altering the underlying molecular crystal structure of the substrate (abstract).

Maekawa et al in view of Engelsberg et al teach all limitations of the claims except for a particle localization unit for determining the input position coordinate of the particles to the surface of the substrate.

Vaught teach an apparatus (Fig. 1) for dislodging particles from a wafer surface. The apparatus includes a particle detector 15 and the computer 19 for locating and storing the locations of particles on a wafer 11. The computer 19 being responsive to a particle detector 15 and controlling element 17 to select shock waves point of origin. The computer may control scanning of the entire wafer by shock wave producing element 17. (abstract, column 3, lines 24-34).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the particle detector and the computer system as taught by Vaught in the

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apparatus of Maekawa et al in view of Engelsberg et al in order to direct the laser beam on particles detected on the surface of substrate.

*Further regarding integration of the particle detector unit and the particle removal unit within a single process chamber:* According to *in re Dulberg*, 289 F.2d 522, 523, 129 USPQ 348, 349 (CCPA 1961) (see MPEP 2144.04 V.B making integral and MPEP 2144.04 V.C making separable) it would have been obvious to one of ordinary skill in the art at the time the invention was made to integrate two separate units into a single unit in order to reduce the space occupied by the apparatus as well as the apparatus manufacturing cost.

*Further regarding type of lasers:* It would have been obvious to one of ordinary skill in the art at the time of the invention to employ various types of conventional laser sources as an art recognized equivalent for each other in a laser-based particle removing apparatus. See MPEP 2144.06, Art Recognized Equivalent for the Same Purpose, Substituting Equivalents Known for the Same Purpose (*in re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982)).

**Claims 12-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maekawa et al (EP-0,764,478-A1) in view of Engelsberg et al (US Patent No. 5,531,857) and Vaught (US Patent No. 5,023,424) as applied to claims 1, 3, 5-11, 21, 22 above, and further in view of Allen (US Patent No. 4,987,286).**

Maekawa et al in view of Engelsberg et al and Vaught teach all limitations of the claims except for the optical arm including channels for conveying vapor to the substrate surface and exhausting vapor from the substrate surface.

Allen teaches an apparatus for dislodging particles from a surface by interposing an energy transfer medium between particles and the surface to be cleaned and irradiating the

medium with laser energy at a wavelength which is strongly absorbed by the medium such that the medium absorbs sufficient energy to cause explosive evaporation with sufficient force to dislodge the particles (abstract). The apparatus (Figs. 4, 5) includes a liquid source 60 for introducing a liquid such as water to the surface of a substrate 54 by a dosing tube 61; and a laser source 64 for irradiating the wet surface area (column 7, line 43 through column 8, line 17). In another embodiment (Fig. 5) the apparatus also includes a gas source 70 having an inlet conduit 71 for introducing a gas jet and a vacuum source 72 having a conduit 73 for drawing away particles freed by the laser 65 (column 9, lines 6-35).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the liquid introducing, the gas introducing and the vacuum source as taught by Allen in the apparatus of Maekawa et al in view of Engelsberg et al and Vaught in order to cause explosive evaporation to dislodge the particles to be removed and further to draw away particles freed from the surface.

### ***Claim Rejections - 35 USC § 102***

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claims 23-26, 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Engelsberg (US Patent No. 5,821,175).**

Engelsberg teaches an apparatus for removing surface contaminants from the surface of a substrate by high energy radiation without damaging the substrate. The apparatus includes a means for flowing a gas 18 over a substrate 12 and a radiation source 14 such as a laser for generating a radiation 11 directed against the treatment surface of the substrate (Figs. 1, 2,

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column 8, line 44 through column 9, line 60). The radiation from a radiation source 14 can be conducted through a radiation conduit 50 which is an optical guide such as a bundle of optical fibers or light pipe while a gas is conducted from a gas source 16 to the treatment surface via gas line 51. radiation conduit 50 and gas line 51 merge to a cable head 53 (Fig. 5, column 21, line 60 through column 22, line 6). The cable 53 through a robotic arm 81 can spin 360 degree and a base 83 thereof can be moved up and down (Fig. 19, column 24, lines 14-25).

The apparatus is incorporated into a cluster tool as shown in Fig. 32, wherein the cluster tool further including a central substrate staging chamber 320 for transferring an article 321 into various processing tool enclosures 302, 304, 306 and 308 (column 20, line 40 through column 21, line 26).

***Claim Rejections - 35 USC § 103***

**Claims 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Engelsberg (US Patent No. 5,821,175) in view of Vaught (US Patent No. 5,023,424).**

Engelsberg teaches all limitations of the claims except for a particle localization unit for determining the input position coordinate of the particles to the surface of the substrate.

Vaught teach an apparatus (Fig. 1) for dislodging particles from a wafer surface. The apparatus includes a particle detector 15 and the computer 19 for locating and storing the locations of particles on a wafer 11. The computer 19 being responsive to a particle detector 15 and controlling element 17 to select shock waves point of origin. The computer may control scanning of the entire wafer by shock wave producing element 17. (abstract, column 3, lines 24-34).



Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the particle detector and the computer system as taught by Vaught in the apparatus of Engelsberg in order to direct the laser beam on particles detected on the surface of substrate.

**Claims 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Engelsberg (US Patent No. 5,821,175) in view of Allen (US Patent No. 4,987,286).**

Engelsberg teaches all limitations of the claims except for the optical arm including channels for conveying vapor to the substrate surface and exhausting vapor from the substrate surface.

Allen teaches an apparatus for dislodging particles from a surface by interposing an energy transfer medium between particles and the surface to be cleaned and irradiating the medium with laser energy at a wavelength which is strongly absorbed by the medium such that the medium absorbs sufficient energy to cause explosive evaporation with sufficient force to dislodge the particles (abstract). The apparatus (Figs. 4, 5) includes a liquid source 60 for introducing a liquid such as water to the surface of a substrate 54 by a dosing tube 61; and a laser source 64 for irradiating the wet surface area (column 7, line 43 through column 8, line 17). In another embodiment (Fig. 5) the apparatus also includes a gas source 70 having an inlet conduit 71 for introducing a gas jet and a vacuum source 72 having a conduit 73 for drawing away particles freed by the laser 65 (column 9, lines 6-35).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the liquid introducing, the gas introducing and the vacuum source as

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taught by Allen in the apparatus of Engelsberg in order to cause explosive evaporation to dislodge the particles to be removed and further to draw away particles freed from the surface.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1, 3, 5-18, 21-33 have been considered but are moot in view of the new ground(s) of rejection.

The Applicants assert that the neither of the prior art of record teaches a the particle detection and the particle removal system being disposed in a single process chamber wherein a single wafer stage is used to scan the surface of a wafer.

The Examiner argues that it would have been obvious to one of ordinary skills in the art to integrate the particle detection and the particle removal unit into a single process chamber for the purpose of reducing the apparatus space and cost. *Furthermore, claim 23 does not include the particle detector as cited in claim 1.*

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.


*Maurer (US Patent No. 5,634,230)* teach an apparatus (Fig. 2) including an inspection device to identify position of contaminants on a surface and a probe for removing the particles from the surface, the probe 40 having a tip 41 can be moved in XY plane as well as in vertical Z plane (abstract and column 4, lines 1-15).

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*Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Parviz Hassanzadeh** whose telephone number is (703)308-2050. The examiner can normally be reached on Tuesday-Friday.*

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory L. Mills can be reached on (703)308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are (703)872-9310 for regular communications and (703)872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0661.

  
Parviz Hassanzadeh  
Examiner  
Art Unit 1763

February 28, 2003